

## SEQUENCE LISTING



<110> JESTIN, JEAN-LUC  
VICHIER-GUERRE, SOPHIE

<120> METHODS FOR OBTAINING THERMOSTABLE ENZYMES, DNA POLYMERASE I VARIANTS FROM THERMUS AQUATICUS HAVING NEW CATALYTIC ACTIVITIES, METHODS FOR OBTAINING THE SAME, AND APPLICATIONS OF THE SAME

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<141> 2004-02-27

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<170> PatentIn version 3.3

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gcctctccca	ggagctagcc	atcccttacg	aggaggccca	ggccttcatt	gagcgctact	1260
ttcagagctt	ccccaaagg	tgccgtgg	ttgagaagac	cctggaggag	ggcaggaggc	1320
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ccaggatg	ccttcagg	cacgacg	tggcctcga	ggccccaaa	gagggggcgg	1560
aggccgtgg	ccggctgg	aaggagg	tggaggggt	gtatccc	gccgtcccc	1620
tggaggtgg	ggtgggata	ggggaggaca	ggctctccgc	caaggaggcg	gccgcactgg	1680
tgccgcgc						1688

<210> 22  
 <211> 562  
 <212> PRT  
 <213> *Thermus aquaticus*  
 <400> 22

Met	Ala	Ser	Gly	Gly	Gly	Cys	Gly	Gly	Gly	Gly	Ser	Pro	Lys	Ala
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Leu	Glu	Glu	Ala	Pro	Trp	Pro	Pro	Pro	Glu	Gly	Ala	Phe	Val	Gly	Phe
												20	25		30

Val	Leu	Ser	Arg	Lys	Glu	Pro	Met	Trp	Ala	Asp	Leu	Leu	Ala	Leu	Ala
							35			40		45			

Ala	Ala	Arg	Gly	Gly	Arg	Val	His	Arg	Ala	Pro	Glu	Pro	Tyr	Lys	Ala
						50				55		60			

Leu Arg Asp Leu Lys Glu Ala Arg Gly Leu Leu Ala Lys Asp Leu Ser  
65 70 75 80

Val Leu Ala Leu Arg Glu Gly Leu Gly Leu Pro Pro Gly Asp Asp Pro  
85 90 95

Met Leu Leu Ala Tyr Leu Leu Asp Pro Ser Asn Thr Thr Pro Glu Gly  
100 105 110

Val Ala Arg Arg Tyr Gly Gly Glu Trp Thr Glu Glu Ala Gly Glu Arg  
115 120 125

Ala Ala Leu Ser Glu Arg Leu Phe Ala Asn Leu Trp Gly Arg Leu Glu  
130 135 140

Gly Glu Glu Arg Leu Leu Trp Leu Tyr Arg Glu Val Glu Arg Pro Leu  
145 150 155 160

Ser Ala Val Leu Ala His Met Glu Ala Thr Gly Val Arg Leu Asp Val  
165 170 175

Ala Tyr Leu Arg Ala Leu Ser Leu Glu Val Ala Glu Glu Ile Ala Arg  
180 185 190

Leu Glu Ala Glu Val Phe Arg Leu Ala Gly His Pro Phe Asn Leu Asn  
195 200 205

Ser Arg Asp Gln Leu Glu Arg Val Leu Phe Asp Glu Leu Gly Leu Pro  
210 215 220

Ala Ile Gly Lys Thr Glu Lys Thr Gly Lys Arg Ser Thr Ser Ala Ala  
225 230 235 240

Val Leu Gly Ala Leu Arg Glu Ala His Pro Ile Val Glu Lys Ile Leu  
245 250 255

Gln Tyr Arg Glu Leu Thr Lys Leu Lys Ser Thr Tyr Ile Asp Pro Leu  
260 265 270

Pro Asp Leu Ile His Pro Arg Thr Gly Arg Leu His Thr Arg Phe Asn  
275 280 285

Gln Thr Ala Thr Ala Thr Gly Arg Leu Ser Ser Ser Asp Pro Asn Leu  
290 295 300

Gln Asn Ile Pro Val Arg Thr Pro Leu Gly Gln Arg Ile Arg Arg Ala  
305 310 315 320

Phe Ile Ala Glu Glu Gly Trp Leu Leu Val Thr Leu Asp Tyr Ser Gln  
325 330 335

Ile Glu Leu Arg Val Leu Ala His Leu Ser Gly Asp Glu Asn Leu Ile  
340 345 350

Arg Val Phe Gln Glu Gly Arg Asp Ile His Thr Glu Thr Ala Ser Trp  
355 360 365

Met Phe Gly Val Pro Arg Glu Ala Val Asp Pro Leu Met Arg Arg Ala  
370 375 380

Ala Lys Thr Ile Asn Phe Gly Val Leu Tyr Gly Met Ser Ala His Arg  
385 390 395 400

Leu Ser Gln Glu Leu Ala Ile Pro Tyr Glu Glu Ala Gln Ala Phe Ile  
405 410 415

Glu Arg Tyr Phe Gln Ser Phe Pro Lys Val Arg Ala Trp Ile Glu Lys  
420 425 430

Thr Leu Glu Glu Gly Arg Arg Arg Gly Tyr Val Glu Thr Leu Phe Gly  
435 440 445

Arg Arg Arg Tyr Val Pro Asp Leu Glu Ala Arg Val Lys Ser Val Arg  
450 455 460

Glu Ala Ala Glu Arg Met Ala Phe Asn Met Pro Val Gln Gly Thr Ala  
465 470 475 480

Ala Asp Leu Met Lys Leu Ala Met Val Lys Leu Phe Pro Arg Leu Glu  
485 490 495

Glu Met Gly Ala Arg Met Leu Leu Gln Val His Asp Glu Leu Val Leu  
500 505 510

Glu Ala Pro Lys Glu Gly Ala Glu Ala Val Ala Arg Leu Ala Lys Glu  
515 520 525

Val Met Glu Gly Val Tyr Pro Leu Ala Val Pro Leu Glu Val Glu Val  
530 535 540

Gly Ile Gly Glu Asp Arg Leu Ser Ala Lys Glu Ala Ala Ala Leu Val  
545 550 555 560

Pro Arg

<210> 23  
<211> 1688  
<212> DNA  
<213> *Thermus aquaticus*

<400> 23  
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ccccctggcc cccgccccgaa ggggccttcg tgggctttgt gcttcccgca aaggagccca  
tgtggccga tcttctggcc ctggccgccc ccaggggggg ccgggtccac cgggcccccg 120  
agccttataa agccctcagg gacctgaagg aggcgcgaaa gcttctcgcc aaagacctga  
gcgttctggc cctgagggaa ggccttggcc tcccggccgg cgacgacccc atgctcctcg 180  
cctacaccttcc ggacccttcc aacaccaccc ccgaggggggt ggcccgccgc tacggcgaaa 240  
agtggacgga ggaggcgaaa gagcgcccg ccctttccga gaggctttc gccaacctgt  
gggggaggct tgagggggag gagaggctcc tttggctta ccgggaggtg gagaggcccc 300  
tttccgctgt cctggcccac atggaggcca cgggggtgcg cctggacgtg gcctatctca  
gggccttgtc cctggaggtg gccgaggaga tcgccccct cgaggccgag gtcttccgccc 360  
420  
480  
540  
600

tggccggcca	ccccttccaa	ctcaaccaac	gggaccagct	ggaaagggtc	ctcttgacg	660
agcttagggct	tcccgccatc	ggcaagacgg	agaagaccgg	caagcgctcc	accagcgccg	720
ccgtcctgga	ggccctccgc	gaggcccacc	ccatcgtgga	gaagatcctg	cagtaccggg	780
agctcaacaa	gctgaagagc	acccaaatta	ctcagttgcc	ggacctcatc	caccccagga	840
cgggcccgcct	ccacacccgc	ttcaaccaga	cggccacgca	aacgggcagg	ctaatagtagct	900
cccagcccaa	cctccagaac	atccccgtcc	gcaccccgct	tgggcagagg	atccgcccgg	960
ccttcatcgc	cgaggagggg	aggctattgg	tggccctgga	ctataaccag	atagagctca	1020
gggtgctggc	ccacctctcc	ggcgacgaga	acctgatccg	ggtcttccag	gaggggcggg	1080
acatccacac	ggagaccgccc	agctggatgt	tcggcgtccc	ccgggaggcc	gtggacccccc	1140
tgatgcgccg	ggcggccaag	accatcaact	tcggggtcct	ctacggcatg	tcggcccacc	1200
gcctctccca	ggagctagcc	atcccttacg	aggaggccca	ggccttcatt	gagcgctact	1260
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aggccgtggc	ccggctggcc	aaggaggta	tggagggggt	gtatcccctg	gccgtgcctc	1620
tggaggtgga	ggtggggata	ggggaggact	ggctctccgc	caaggaggcg	gccgcactgg	1680
tgccgcgc						1688

<210> 24  
 <211> 562  
 <212> PRT  
 <213> *Thermus aquaticus*

<400> 24

Met Ala Ser Gly Gly Gly Gly Cys Gly Gly Gly Ser Pro Lys Ala  
 1 5 10 15

Leu Glu Glu Ala Pro Trp Pro Pro Pro Glu Gly Ala Phe Val Gly Phe  
20 25 30

Val Leu Ser Arg Lys Glu Pro Met Trp Ala Asp Leu Leu Ala Leu Ala  
35 40 45

Ala Ala Arg Gly Gly Arg Val His Arg Ala Pro Glu Pro Tyr Lys Ala  
50 55 60

Leu Arg Asp Leu Lys Glu Ala Arg Gly Leu Leu Ala Lys Asp Leu Ser  
65 70 75 80

Val Leu Ala Leu Arg Glu Gly Leu Gly Leu Pro Pro Gly Asp Asp Pro  
85 90 95

Met Leu Leu Ala Tyr Leu Leu Asp Pro Ser Asn Thr Thr Pro Glu Gly  
100 105 110

Val Ala Arg Arg Tyr Gly Gly Glu Trp Thr Glu Glu Ala Gly Glu Arg  
115 120 125

Ala Ala Leu Ser Glu Arg Leu Phe Ala Asn Leu Trp Gly Arg Leu Glu  
130 135 140

Gly Glu Glu Arg Leu Leu Trp Leu Tyr Arg Glu Val Glu Arg Pro Leu  
145 150 155 160

Ser Ala Val Leu Ala His Met Glu Ala Thr Gly Val Arg Leu Asp Val  
165 170 175

Ala Tyr Leu Arg Ala Leu Ser Leu Glu Val Ala Glu Glu Ile Ala Arg  
180 185 190

Leu Glu Ala Glu Val Phe Arg Leu Ala Gly His Pro Phe Gln Leu Asn  
195 200 205

Gln Arg Asp Gln Leu Glu Arg Val Leu Phe Asp Glu Leu Gly Leu Pro  
210 215 220

Ala Ile Gly Lys Thr Glu Lys Thr Gly Lys Arg Ser Thr Ser Ala Ala  
225 230 235 240

Val Leu Glu Ala Leu Arg Glu Ala His Pro Ile Val Glu Lys Ile Leu  
245 250 255

Gln Tyr Arg Glu Leu Asn Lys Leu Lys Ser Thr Gln Ile Thr Gln Leu  
260 265 270

Pro Asp Leu Ile His Pro Arg Thr Gly Arg Leu His Thr Arg Phe Asn  
275 280 285

Gln Thr Ala Thr Gln Thr Gly Arg Leu Ser Ser Ser Gln Pro Asn Leu  
290 295 300

Gln Asn Ile Pro Val Arg Thr Pro Leu Gly Gln Arg Ile Arg Arg Thr  
305 310 315 320

Phe Ile Ala Glu Glu Gly Arg Leu Leu Val Ala Leu Asp Tyr Asn Gln  
325 330 335

Ile Glu Leu Arg Val Leu Ala His Leu Ser Gly Asp Glu Asn Leu Ile  
340 345 350

Arg Val Phe Gln Glu Gly Arg Asp Ile His Thr Glu Thr Ala Ser Trp  
355 360 365

Met Phe Gly Val Pro Arg Glu Ala Val Asp Pro Leu Met Arg Arg Ala  
370 375 380

Ala Lys Thr Ile Asn Phe Gly Val Leu Tyr Gly Met Ser Ala His Arg  
385 390 395 400

Leu Ser Gln Glu Leu Ala Ile Pro Tyr Glu Glu Ala Gln Ala Phe Ile  
405 410 415

Glu Arg Tyr Phe Gln Ser Phe Pro Lys Val Arg Ala Trp Ile Glu Lys  
420 425 430

Thr Leu Glu Glu Gly Arg Arg Arg Gly Tyr Val Glu Thr Leu Phe Gly  
435 440 445

Arg Arg Arg Tyr Leu Pro Asp Leu Glu Ala Gln Val Lys Asn Val Arg  
450 455 460

Glu Ala Ala Glu Arg Arg Ala Phe Asn Met Pro Val Gln Gly Thr Ala  
465 470 475 480

Ala Asp Leu Met Lys Leu Ala Met Val Lys Leu Phe Pro Arg Leu Glu  
485 490 495

Glu Met Gly Ala Arg Met Leu Leu Gln Val His Asp Glu Leu Val Leu  
500 505 510

Glu Ala Pro Lys Glu Gly Ala Glu Ala Val Ala Arg Leu Ala Lys Glu  
515 520 525

Val Met Glu Gly Val Tyr Pro Leu Ala Val Pro Leu Glu Val Glu Val  
530 535 540

Gly Ile Gly Glu Asp Trp Leu Ser Ala Lys Glu Ala Ala Ala Leu Val  
545 550 555 560

Pro Arg

<210> 25  
<211> 1688  
<212> DNA  
<213> *Thermus aquaticus*

<400> 25  
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ccccctggcc cccgccccaa ggggccttcg tgggcttgcgt gctttccgc aaggagccca 120  
tgtgggccga tcttctggcc ctggccgccc ccaggggggg ccgggtccac cgggcccccg 180  
agccttataa agccctcagg gacctgaagg aggcgcgaaa gcttctcgcc aaagacctga 240

gcgttctggc cctgagggaa ggccttggcc tcccgcggcg cgacgacccc atgctcctcg	300
cctacaccttcc ggacccttcc aacaccaccc ccgaggggggt ggcccggcgc tacggcgggg	360
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tttccgctgt cctggcccac atggaggcca cgggggtgcg cctggacgtg gcctatctca	540
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tggccggcca ccccttcaac ctcaactccc gggaccagct ggaaagggtc ctcttgacg	660
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ccgtcctgga ggccctccgc gaggcccacc ccatcgtgga gaagatcctg cagtaccggg	780
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ccgatcccaa cctccagaac atccccgtcc gcaccccgct tggcagagg atccgcccgg	960
ccttcatcgc cgaggagggg tggctattgg tggccctgga ctatagccag atagagctca	1020
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acatccacac ggagacccgc agctggatgt tcggcgtccc cgggaggcc gtggacccccc	1140
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aggccgtggc ccggctggcc aaggaggta tggaggggggt gtatcccctg gccgtgcccc	1620
tggaggtgga ggtggggata gggaggact ggctctccgc caaggaggcg gccgcactgg	1680
tgccgcgc	1688

<210> 26  
<211> 562  
<212> PRT  
<213> *Thermus aquaticus*

<400> 26

Met Ala Ser Gly Gly Gly Gly Cys Gly Gly Gly Ser Pro Lys Ala  
1 5 10 15

Leu Glu Glu Ala Pro Trp Pro Pro Pro Glu Gly Ala Phe Val Gly Phe  
20 25 30

Val Leu Ser Arg Lys Glu Pro Met Trp Ala Asp Leu Leu Ala Leu Ala  
35 40 45

Ala Ala Arg Gly Gly Arg Val His Arg Ala Pro Glu Pro Tyr Lys Ala  
50 55 60

Leu Arg Asp Leu Lys Glu Ala Arg Gly Leu Leu Ala Lys Asp Leu Ser  
65 70 75 80

Val Leu Ala Leu Arg Glu Gly Leu Gly Leu Pro Pro Gly Asp Asp Pro  
85 90 95

Met Leu Leu Ala Tyr Leu Leu Asp Pro Ser Asn Thr Thr Pro Glu Gly  
100 105 110

Val Ala Arg Arg Tyr Gly Gly Glu Trp Thr Glu Glu Ala Gly Glu Arg  
115 120 125

Ala Ala Leu Ser Glu Arg Leu Phe Ala Asn Leu Trp Gly Arg Leu Glu  
130 135 140

Gly Glu Glu Arg Leu Leu Trp Leu Tyr Arg Glu Val Glu Arg Pro Leu  
145 150 155 160

Ser Ala Val Leu Ala His Met Glu Ala Thr Gly Val Arg Leu Asp Val  
165 170 175

Ala Tyr Leu Arg Ala Leu Ser Leu Glu Val Ala Glu Glu Ile Ala Arg  
180 185 190

Leu Glu Ala Glu Val Phe Arg Leu Ala Gly His Pro Phe Asn Leu Asn  
195 200 205

Ser Arg Asp Gln Leu Glu Arg Val Leu Phe Asp Glu Leu Gly Leu Pro  
210 215 220

Ala Ile Gly Lys Thr Glu Lys Thr Gly Lys Arg Ser Thr Ser Ala Ala  
225 230 235 240

Val Leu Glu Ala Leu Arg Glu Ala His Pro Ile Val Glu Lys Ile Leu  
245 250 255

Gln Tyr Arg Glu Leu Thr Lys Leu Lys Ser Thr Tyr Ile Asp Pro Leu  
260 265 270

Pro Asp Leu Ile His Pro Arg Thr Gly Arg Leu His Thr Arg Phe Asn  
275 280 285

Gln Thr Ala Thr Ala Thr Gly Arg Leu Ser Ser Ser Asp Pro Asn Leu  
290 295 300

Gln Asn Ile Pro Val Arg Thr Pro Leu Gly Gln Arg Ile Arg Arg Ala  
305 310 315 320

Phe Ile Ala Glu Glu Gly Trp Leu Leu Val Ala Leu Asp Tyr Ser Gln  
325 330 335

Ile Glu Leu Arg Val Leu Ala His Leu Ser Gly Asp Glu Asn Leu Ile  
340 345 350

Arg Val Phe Gln Glu Gly Arg Asp Ile His Thr Glu Thr Ala Ser Trp  
355 360 365

Met Phe Gly Val Pro Arg Glu Ala Val Asp Pro Leu Met Arg Arg Ala  
370 375 380

Ala Lys Thr Ile Asn Phe Gly Val Leu Tyr Gly Met Ser Ala His Arg  
385 390 395 400

Leu Ser Gln Glu Leu Ala Ile Pro Tyr Glu Glu Ala Gln Ala Phe Ile  
405 410 415

Glu Arg Tyr Phe Gln Ser Phe Pro Lys Val Arg Ala Trp Ile Glu Lys  
420 425 430

Thr Leu Glu Glu Gly Arg Arg Gly Tyr Val Glu Thr Leu Phe Gly  
435 440 445

Arg Arg Arg Tyr Val Pro Asp Leu Glu Ala Arg Val Lys Ser Val Arg  
450 455 460

Glu Ala Ala Glu Arg Met Ala Phe Asn Met Pro Val Gln Gly Thr Ala  
465 470 475 480

Ala Asp Leu Met Lys Leu Ala Met Val Lys Leu Phe Pro Arg Leu Glu  
485 490 495

Glu Met Gly Ala Arg Met Leu Leu Gln Val His Asp Glu Leu Val Leu  
500 505 510

Glu Ala Pro Lys Glu Arg Ala Glu Ala Val Ala Arg Leu Ala Lys Glu  
515 520 525

Val Met Glu Gly Val Tyr Pro Leu Ala Val Pro Leu Glu Val Glu Val  
530 535 540

Gly Ile Gly Glu Asp Trp Leu Ser Ala Lys Glu Ala Ala Ala Leu Val  
545 550 555 560

Pro Arg

<211> 1688  
 <212> DNA  
 <213> Thermus aquaticus

<400> 27  
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 cccccctggcc cccgccccaa ggggccttcg tgggtttgt gctttcccg aaggagccca 120  
 tgtggccga tcttctggcc ctggccgccc ccaggggggg ccgggtccac cggggcccccg 180  
 agccttataa agccctcagg gacctgaagg aggcgccccg gcttctcgcc aaagacctga 240  
 gcgttctggc cctgagggaa ggccttggcc tcccgccccg cgacgacccc atgctcctcg 300  
 cctacccctt ggacccttcc aacaccaccc ccgaggggggt ggcccggcgc tacggcgggg 360  
 agtggacgga ggaggcgccccg ccctttccga gaggctctc gccaacctgt 420  
 gggggaggct tgagggggag gagaggctcc tttggctta ccgggagggtg gagaggcccc 480  
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 tggccggcca ccccttcaac ctcaactccc gggaccagct ggaaagggtc ctcttgacg 660  
 agctagggtc tcccgccatc ggcaagacgg agaagaccgg caagcgctcc accagcgccg 720  
 tcgtcctgga ggccctccgc gaggcccacc ccatcgtgga gaagatcctg cagtaccggg 780  
 agctcaccaa gctgaagagc acctacattt accccttgcg ggacctcatc cacccccagga 840  
 cgggccccct ccacacccgc ttcaaccaga cggccacggc cacgggcagg ctaagtagct 900  
 ccgatcccaa cctccagaac atccccgtcc gcaccccgct tggcagagg atccgcccggg 960  
 ccttcatcgc cgaggagggg tggctattgg tggccctgga ctatagccag atagagctca 1020  
 gggtgctggc ccacctctcc ggcgacgaga acctgatccg ggtcttccag gagggcgccc 1080  
 acatccacac ggagaccggc agctggatgt tcggcgtccc ccgggaggcc gtggacccccc 1140  
 tcatgcggccg ggcggccaag agcatcaact tcggggtcct ctacggcatg tcggcccccacc 1200  
 gcctctccca ggagctagcc atcccttacg aggaggccca ggccttcatt gagcgctact 1260  
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 gggggtagt ggagaccctc ttcggccgccc gccgctacgt gccagaccta gagggccccggg 1380

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aggccgtggc	ccggctggcc	aaggaggtca	tggaggggggt	gtatcccctg	gccgtgcccc	1620
tggaggtgga	ggtggggata	ggggaggacc	ggctctccgc	caaggaggcg	gccgcactgg	1680
tgccgcgc						1688

<210> 28  
 <211> 562  
 <212> PRT  
 <213> *Thermus aquaticus*

<400> 28

Met	Ala	Ser	Gly	Gly	Gly	Gly	Cys	Gly	Gly	Gly	Gly	Ser	Pro	Lys	Ala
1								10						15	

Leu	Glu	Glu	Ala	Pro	Trp	Pro	Pro	Pro	Glu	Gly	Ala	Phe	Val	Gly	Phe
20								25					30		

Val	Leu	Ser	Arg	Lys	Glu	Pro	Met	Trp	Ala	Asp	Leu	Leu	Ala	Leu	Ala
35							40					45			

Ala	Ala	Arg	Gly	Gly	Arg	Val	His	Arg	Ala	Pro	Glu	Pro	Tyr	Lys	Ala
50								55			60				

Leu	Arg	Asp	Leu	Lys	Glu	Ala	Arg	Gly	Leu	Leu	Ala	Lys	Asp	Leu	Ser
65					70				75				80		

Val	Leu	Ala	Leu	Arg	Glu	Gly	Leu	Gly	Leu	Pro	Pro	Gly	Asp	Asp	Pro
85								90					95		

Met	Leu	Leu	Ala	Tyr	Leu	Leu	Asp	Pro	Ser	Asn	Thr	Thr	Pro	Glu	Gly
100							105					110			

Val	Ala	Arg	Arg	Tyr	Gly	Gly	Glu	Trp	Thr	Glu	Glu	Ala	Gly	Glu	Arg
115							120				125				

Ala Ala Leu Ser Glu Arg Leu Phe Ala Asn Leu Trp Gly Arg Leu Glu  
130 135 140

Gly Glu Glu Arg Leu Leu Trp Leu Tyr Arg Glu Val Glu Arg Pro Leu  
145 150 155 160

Ser Ala Val Leu Ala His Met Glu Ala Thr Gly Val Arg Leu Asp Val  
165 170 175

Ala Tyr Leu Arg Ala Leu Ser Leu Glu Val Ala Glu Glu Ile Ala Arg  
180 185 190

Leu Glu Ala Glu Val Phe Arg Leu Ala Gly His Pro Phe Asn Leu Asn  
195 200 205

Ser Arg Asp Gln Leu Glu Arg Val Leu Phe Asp Glu Leu Gly Leu Pro  
210 215 220

Ala Ile Gly Lys Thr Glu Lys Thr Gly Lys Arg Ser Thr Ser Ala Val  
225 230 235 240

Val Leu Glu Ala Leu Arg Glu Ala His Pro Ile Val Glu Lys Ile Leu  
245 250 255

Gln Tyr Arg Glu Leu Thr Lys Leu Lys Ser Thr Tyr Ile Asp Pro Leu  
260 265 270

Pro Asp Leu Ile His Pro Arg Thr Gly Arg Leu His Thr Arg Phe Asn  
275 280 285

Gln Thr Ala Thr Ala Thr Gly Arg Leu Ser Ser Ser Asp Pro Asn Leu  
290 295 300

Gln Asn Ile Pro Val Arg Thr Pro Leu Gly Gln Arg Ile Arg Arg Ala  
305 310 315 320

Phe Ile Ala Glu Glu Gly Trp Leu Leu Val Ala Leu Asp Tyr Ser Gln  
325 330 335

Ile Glu Leu Arg Val Leu Ala His Leu Ser Gly Asp Glu Asn Leu Ile  
340 345 350

Arg Val Phe Gln Glu Gly Arg Asp Ile His Thr Glu Thr Ala Ser Trp  
355 360 365

Met Phe Gly Val Pro Arg Glu Ala Val Asp Pro Leu Met Arg Arg Ala  
370 375 380

Ala Lys Ser Ile Asn Phe Gly Val Leu Tyr Gly Met Ser Ala His Arg  
385 390 395 400

Leu Ser Gln Glu Leu Ala Ile Pro Tyr Glu Glu Ala Gln Ala Phe Ile  
405 410 415

Glu Arg Tyr Phe Gln Ser Phe Pro Lys Val Arg Ala Trp Ile Glu Lys  
420 425 430

Thr Leu Glu Glu Gly Arg Arg Gly Tyr Val Glu Thr Leu Phe Gly  
435 440 445

Arg Arg Arg Tyr Val Pro Asp Leu Glu Ala Arg Val Lys Ser Val Arg  
450 455 460

Glu Ala Ala Glu Arg Met Ala Phe Asn Met Pro Val Gln Gly Thr Ala  
465 470 475 480

Ala Asp Leu Met Lys Leu Ala Met Val Lys Leu Ser Pro Arg Leu Glu  
485 490 495

Glu Met Gly Ala Arg Met Leu Leu Gln Val His Asp Glu Leu Val Leu  
500 505 510

Glu Ala Pro Lys Glu Gly Ala Glu Ala Val Ala Arg Leu Ala Lys Glu  
515 520 525

Val Met Glu Gly Val Tyr Pro Leu Ala Val Pro Leu Glu Val Glu Val

530

535

540

Gly Ile Gly Glu Asp Arg Leu Ser Ala Lys Glu Ala Ala Ala Leu Val  
 545 550 555 560

Pro Arg

<210> 29  
 <211> 1688  
 <212> DNA  
 <213> *Thermus aquaticus*

<400> 29  
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 agccttataa agccctcagg gacctgaagg aggcgccccg gcttctcgcc aaagacctga 240  
 gcgttctggc cctgagggaa ggccttggcc tcccgccccg cgacgacccc atgctcctcg 300  
 cctacccctt ggacccttcc aacaccaccc ccgaggggggt ggcccggcgc tacggcgggg 360  
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 gggggaggct tgagggggag gagaggctcc tttggctta ccgggaggtg gagaggcccc 480  
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 tggccggcca ccccttcaac ctcaactccc gggaccagct ggaaagggtc ctcttgacg 660  
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 ccgtccttggaa ggccctccgc gaggcccacc ccatcgttggaa gaagatcctg cagtaccggg 780  
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tgccgcgc	1688

<210> 30  
 <211> 562  
 <212> PRT  
 <213> *Thermus aquaticus*

<400> 30

Met Ala Ser Gly Gly Gly Gly Cys Gly Gly Gly Ser Pro Lys Ala			
1	5	10	15

Leu Glu Glu Ala Pro Trp Pro Pro Pro Glu Gly Ala Phe Val Gly Phe		
20	25	30

Val Leu Ser Arg Lys Glu Pro Met Trp Ala Asp Leu Leu Ala Leu Ala		
35	40	45

Ala Ala Arg Gly Gly Arg Val His Arg Ala Pro Glu Pro Tyr Lys Ala		
50	55	60

Leu Arg Asp Leu Lys Glu Ala Arg Gly Leu Leu Ala Lys Asp Leu Ser			
65	70	75	80

Val Leu Ala Leu Arg Glu Gly Leu Gly Leu Pro Pro Gly Asp Asp Pro  
85 90 95

Met Leu Leu Ala Tyr Leu Leu Asp Pro Ser Asn Thr Thr Pro Glu Gly  
100 105 110

Val Ala Arg Arg Tyr Gly Gly Glu Trp Thr Glu Glu Ala Gly Glu Arg  
115 120 125

Ala Ala Leu Ser Glu Arg Leu Phe Ala Asn Leu Trp Gly Arg Leu Glu  
130 135 140

Gly Glu Glu Arg Leu Leu Trp Leu Tyr Arg Glu Val Glu Arg Pro Leu  
145 150 155 160

Ser Ala Val Leu Ala His Met Glu Ala Thr Gly Val Arg Leu Asp Val  
165 170 175

Ala Tyr Leu Arg Ala Leu Ser Leu Glu Val Ala Glu Glu Ile Ala Arg  
180 185 190

Leu Glu Ala Glu Val Phe Arg Leu Ala Gly His Pro Phe Asn Leu Asn  
195 200 205

Ser Arg Asp Gln Leu Glu Arg Val Leu Phe Asp Glu Leu Gly Leu Pro  
210 215 220

Ala Ile Gly Lys Thr Glu Lys Thr Gly Lys Arg Ser Thr Ser Ala Ala  
225 230 235 240

Val Leu Glu Ala Leu Arg Glu Ala His Pro Ile Val Glu Lys Ile Leu  
245 250 255

Gln Tyr Arg Glu Leu Thr Lys Leu Lys Ser Thr Tyr Ile Asp Pro Leu  
260 265 270

Pro Asp Leu Ile His Pro Arg Thr Gly Arg Leu His Thr Arg Phe Asn  
275 280 285

Gln Thr Val Thr Ala Thr Gly Arg Leu Ser Ser Ser Asp Pro Asn Leu  
290 295 300

Gln Asn Ile Pro Val Arg Thr Pro Leu Gly Gln Arg Ile Arg Arg Ala  
305 310 315 320

Phe Ile Ala Glu Glu Gly Trp Leu Leu Val Ala Leu Asp Tyr Ser Gln  
325 330 335

Ile Glu Leu Arg Val Leu Ala His Leu Ser Gly Asp Glu Asn Leu Ile  
340 345 350

Arg Val Phe Gln Glu Gly Arg Asp Ile His Thr Glu Thr Ala Ser Trp  
355 360 365

Met Phe Gly Val Pro Arg Glu Ala Val Asp Pro Leu Met Arg Arg Ala  
370 375 380

Ala Lys Thr Ile Asn Phe Gly Val Leu Tyr Gly Met Ser Ala His Arg  
385 390 395 400

Leu Ser Gln Glu Leu Ala Ile Pro Tyr Glu Glu Ala Gln Ala Phe Ile  
405 410 415

Glu Arg Tyr Phe Gln Ser Phe Pro Lys Val Arg Ala Trp Ile Glu Lys  
420 425 430

Thr Leu Glu Glu Gly Arg Arg Gly Tyr Val Glu Thr Leu Phe Gly  
435 440 445

Arg Arg Arg Tyr Val Pro Asp Leu Glu Ala Arg Val Lys Ser Val Arg  
450 455 460

Glu Ala Ala Glu Arg Met Ala Tyr Asn Met Pro Val Gln Gly Thr Ala  
465 470 475 480

Ala Asp Leu Met Lys Leu Ala Met Val Lys Leu Phe Pro Arg Leu Glu

485

490

495

Glu Met Gly Ala Arg Met Leu Leu Gln Val His Asp Glu Leu Val Leu  
500 505 510

Glu Ala Pro Lys Glu Gly Ala Glu Ala Val Ala Arg Leu Ala Lys Glu  
515 520 525

Val Met Glu Gly Val Tyr Pro Leu Ala Val Pro Leu Glu Val Glu Val  
530 535 540

Gly Ile Gly Glu Asp Trp Leu Ser Ala Lys Glu Ala Ala Ala Leu Val  
545 550 555 560

Pro Arg

<210> 31  
<211> 1688  
<212> DNA  
<213> *Thermus aquaticus*

<400> 31  
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ccccctggcc cccgccccaa ggggccttcg tgggcttgcgt gctttccgc aaggagccca 120  
tgtgggccga tcttctggcc ctggccgcgg ccaggggggg ccgggtccac cgggcccccg 180  
agccttataa agccctcagg gacctgaagg aggcgcgggg gcttctcgcc aaagacctga 240  
gcgttctggc cctgagggaa ggccttggcc tcccgccccgg cgacgacccc atgctcctcg 300  
cctacacctcct ggacccttcc aacaccaccc ccgaggggggt ggcccggcgc tacggcgggg 360  
agtggacgga ggaggcgggg gagcgcccg ccctttcga gaggctttc gccaacctgt 420  
gggggaggct tgagggggag gagaggctcc ttggcttta ccgggaggtg gagaggcccc 480  
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gggccttgtc cctggaggtg gccgaggaga tcgccccct cgaggccgag gtcttccgcc 600  
tggccggcca ccccttcaac ctcaactccc gggaccagct ggaaagggtc ctctttgacg 660

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agctcaccaa	gctgaagagc	acctacattg	acccttgcc	ggacctcatc	caccccagga	840
cgggcccgcct	ccacacccgc	ttcaaccaga	cggccacggc	cacgggcagg	ctaatgtact	900
ccgatcccaa	cctccagaac	atccccgtcc	gcaccccgct	tggcagagg	atccgcccgg	960
ccttcatcgc	cgaggagggg	tggctattgg	tggccctgga	ctatagccag	atagagctca	1020
gggtgctggc	ccacctctcc	ggcgacgaga	acctgatccg	ggtcttccag	gaggggcggg	1080
acatccacac	ggagaccgccc	agctggatgt	tcggcgtccc	ccgggaggcc	gtggacccccc	1140
tgatgcgccc	ggcggccaag	accatcaact	tcggggtcct	ctacggcatg	tcggcccacc	1200
gcctctccca	ggagctagcc	atcccttacg	aggaggccca	ggccttcatt	gagcgctact	1260
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gggggtacgt	ggagaccctc	ttcggccgccc	gccgctacgt	gccagaccta	gaggcccggg	1380
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ccaggatgct	ccttcaggc	cacgacgagc	tggcctcga	ggccccaaaa	gagggggcgg	1560
aggccgtggc	ccggctggcc	aaggaggta	tggagggggt	gtatcccctg	gccgtgcccc	1620
tggaggtgga	ggtgggata	ggggaggacc	ggctctccgc	caaggaggcg	gccgcactgg	1680
tgccgcgc						1688

<210> 32  
 <211> 562  
 <212> PRT  
 <213> *Thermus aquaticus*  
 <400> 32

Met Ala Ser Gly Gly Gly Gly Cys Gly Gly Gly Ser Pro Lys Ala  
 1 5 10 15

Leu Glu Glu Ala Pro Trp Pro Pro Pro Glu Gly Ala Phe Val Gly Phe  
 20 25 30

Val Leu Ser Arg Lys Glu Pro Met Trp Ala Asp Leu Leu Ala Leu Ala  
35 40 45

Ala Ala Arg Gly Gly Arg Val His Arg Ala Pro Glu Pro Tyr Lys Ala  
50 55 60

Leu Arg Asp Leu Lys Glu Ala Arg Gly Leu Leu Ala Lys Asp Leu Ser  
65 70 75 80

Val Leu Ala Leu Arg Glu Gly Leu Gly Leu Pro Pro Gly Asp Asp Pro  
85 90 95

Met Leu Leu Ala Tyr Leu Leu Asp Pro Ser Asn Thr Thr Pro Glu Gly  
100 105 110

Val Ala Arg Arg Tyr Gly Gly Glu Trp Thr Glu Glu Ala Gly Glu Arg  
115 120 125

Ala Ala Leu Ser Glu Arg Leu Phe Ala Asn Leu Trp Gly Arg Leu Glu  
130 135 140

Gly Glu Glu Arg Leu Leu Trp Leu Tyr Arg Glu Val Glu Arg Pro Leu  
145 150 155 160

Ser Ala Val Leu Ala His Met Glu Ala Thr Gly Val Arg Leu Asp Val  
165 170 175

Ala Tyr Leu Arg Ala Leu Ser Leu Glu Val Ala Glu Glu Ile Ala Arg  
180 185 190

Leu Glu Ala Glu Val Phe Arg Leu Ala Gly His Pro Phe Asn Leu Asn  
195 200 205

Ser Arg Asp Gln Leu Glu Arg Val Leu Phe Asp Glu Leu Gly Leu Pro  
210 215 220

Ala Ile Gly Lys Thr Glu Lys Thr Gly Lys Arg Ser Thr Ser Ala Ala  
225 230 235 240

Val Leu Glu Ala Leu Arg Glu Ala His Pro Ile Val Glu Lys Ile Leu  
245 250 255

Gln Tyr Arg Glu Leu Thr Lys Leu Lys Ser Thr Tyr Ile Asp Pro Leu  
260 265 270

Pro Asp Leu Ile His Pro Arg Thr Gly Arg Leu His Thr Arg Phe Asn  
275 280 285

Gln Thr Ala Thr Ala Thr Gly Arg Leu Ser Ser Ser Asp Pro Asn Leu  
290 295 300

Gln Asn Ile Pro Val Arg Thr Pro Leu Gly Gln Arg Ile Arg Arg Ala  
305 310 315 320

Phe Ile Ala Glu Glu Gly Trp Leu Leu Val Ala Leu Asp Tyr Ser Gln  
325 330 335

Ile Glu Leu Arg Val Leu Ala His Leu Ser Gly Asp Glu Asn Leu Ile  
340 345 350

Arg Val Phe Gln Glu Gly Arg Asp Ile His Thr Glu Thr Ala Ser Trp  
355 360 365

Met Phe Gly Val Pro Arg Glu Ala Val Asp Pro Leu Met Arg Arg Ala  
370 375 380

Ala Lys Thr Ile Asn Phe Gly Val Leu Tyr Gly Met Ser Ala His Arg  
385 390 395 400

Leu Ser Gln Glu Leu Ala Ile Pro Tyr Glu Glu Ala Gln Ala Phe Ile  
405 410 415

Glu Arg Tyr Phe Gln Ser Phe Pro Lys Val Arg Ala Trp Ile Glu Lys  
420 425 430

Thr Leu Glu Glu Gly Arg Arg Gly Tyr Val Glu Thr Leu Phe Gly

435

440

445

Arg Arg Arg Tyr Val Pro Asp Leu Glu Ala Arg Val Lys Ser Val Arg  
450 455 460

Glu Ala Ala Glu Arg Met Ala Phe Asn Met Pro Val Gln Gly Thr Ala  
465 470 475 480

Ala Asp Leu Met Lys Leu Ala Met Val Lys Leu Phe Pro Arg Leu Glu  
485 490 495

Glu Met Gly Ala Arg Met Leu Leu Gln Val His Asp Glu Leu Val Leu  
500 505 510

Glu Ala Pro Lys Glu Gly Ala Glu Ala Val Ala Arg Leu Ala Lys Glu  
515 520 525

Val Met Glu Gly Val Tyr Pro Leu Ala Val Pro Leu Glu Val Glu Val  
530 535 540

Gly Ile Gly Glu Asp Arg Leu Ser Ala Lys Glu Ala Ala Ala Leu Val  
545 550 555 560

Pro Arg

<210> 33  
<211> 1688  
<212> DNA  
<213> *Thermus aquaticus*

<400> 33  
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ccccctggcc cccgccccaa ggggccttcg tgggctttgt gctttcccg aaggagccca 120  
tgtgggccga tcttctggcc ctggccgccc ccaggggggg ccgggtccac cgggcccccg 180  
agccttataa agccctcagg gacctgaagg aggcgcgaaa gcttctcgcc aaagacctga 240  
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cctacccctt ggacccttcc aacaccaccc ccgaggggggt ggcccggcgc tacggcgggg	360
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ccgtccctgga ggcgcctccgc gaggcccacc ccatcgtgga gaagatcctg cagtaccggg	780
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ccgatcccaa cctccagaac atccccgtcc gcaccccgct tggcagagg atccgcccggg	960
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acatccacac ggagacccgc agctggatgt tcggcgtccc cggggaggcc gtggacccccc	1140
tgtatgcgcg ggcggccaag accatcaact tcggggtcct ctacggcatg tcggccacc	1200
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aggccgtggc ccggctggcc aaggaggta tggaggggggt gtatccctg gccgtgctcc	1620
tggaggtgga ggtggggata ggggaggact ggctctccgc caaggaggcg gccgcactgg	1680
tgccgcgc	1688

<210> 34  
<211> 562

<212> PRT

<213> *Thermus aquaticus*

<400> 34

Met Ala Ser Gly Gly Gly Gly Cys Gly Gly Gly Ser Pro Lys Ala  
1 5 10 15

Leu Glu Glu Ala Pro Trp Pro Pro Pro Glu Gly Ala Phe Val Gly Phe  
20 25 30

Val Leu Ser Arg Lys Glu Pro Met Trp Ala Asp Leu Leu Ala Leu Ala  
35 40 45

Ala Ala Arg Gly Gly Arg Val His Arg Ala Pro Glu Pro Tyr Lys Ala  
50 55 60

Leu Arg Asp Leu Lys Glu Ala Arg Gly Leu Leu Ala Lys Asp Leu Ser  
65 70 75 80

Val Leu Ala Leu Arg Glu Gly Leu Gly Leu Pro Pro Gly Asp Asp Pro  
85 90 95

Met Leu Leu Ala Tyr Leu Leu Asp Pro Ser Asn Thr Thr Pro Glu Gly  
100 105 110

Val Ala Arg Arg Tyr Gly Gly Glu Trp Thr Glu Glu Ala Gly Glu Arg  
115 120 125

Ala Ala Leu Ser Glu Arg Leu Phe Ala Asn Leu Trp Gly Arg Leu Glu  
130 135 140

Gly Glu Glu Arg Leu Leu Trp Leu Tyr Arg Glu Val Glu Arg Pro Leu  
145 150 155 160

Ser Ala Val Leu Ala His Met Glu Ala Thr Gly Val Arg Leu Asp Val  
165 170 175

Ala Tyr Leu Arg Ala Leu Ser Leu Glu Val Ala Glu Glu Ile Ala Arg  
180 185 190

Leu Glu Ala Glu Val Phe Arg Leu Ala Gly His Pro Phe Asn Leu Asn  
195 200 205

Ser Arg Asp Gln Leu Glu Arg Val Leu Phe Asp Glu Leu Gly Leu Pro  
210 215 220

Ala Ile Gly Lys Thr Glu Lys Thr Gly Lys Arg Ser Thr Ser Ala Ala  
225 230 235 240

Val Leu Glu Ala Leu Arg Glu Ala His Pro Ile Val Glu Lys Ile Leu  
245 250 255

Gln Tyr Arg Glu Leu Thr Lys Leu Lys Ser Thr Tyr Ile Asp Pro Leu  
260 265 270

Pro Asp Leu Ile His Pro Arg Thr Gly Arg Leu His Thr Arg Phe Asn  
275 280 285

Gln Thr Ala Thr Ala Thr Gly Arg Leu Ser Ser Ser Asp Pro Asn Leu  
290 295 300

Gln Asn Ile Pro Val Arg Thr Pro Leu Gly Gln Arg Ile Arg Arg Ala  
305 310 315 320

Phe Ile Ala Glu Glu Gly Trp Leu Leu Val Ala Leu Asp Tyr Ser Gln  
325 330 335

Ile Glu Leu Arg Val Leu Ala His Leu Ser Gly Asp Glu Asn Leu Ile  
340 345 350

Arg Val Phe Gln Glu Gly Arg Asp Ile His Thr Glu Thr Ala Ser Trp  
355 360 365

Met Phe Gly Val Pro Arg Glu Ala Val Asp Pro Leu Met Arg Arg Ala  
370 375 380

Ala Lys Thr Ile Asn Phe Gly Val Leu Tyr Gly Met Ser Ala His Arg

385

390

395

400

Leu Ser Gln Glu Leu Ala Ile Pro Tyr Glu Glu Ala Gln Ala Phe Ile  
405 410 415

Glu Arg Tyr Phe Leu Ser Phe Pro Lys Val Arg Ala Trp Ile Glu Lys  
420 425 430

Thr Leu Glu Glu Gly Arg Arg Gly Tyr Val Glu Thr Leu Phe Gly  
435 440 445

Arg Arg Arg Tyr Val Pro Asp Leu Glu Ala Arg Val Lys Ser Val Arg  
450 455 460

Glu Ala Ala Glu Arg Lys Ala Phe Asn Met Pro Val Gln Gly Thr Ala  
465 470 475 480

Ala Asp Leu Met Lys Leu Ala Met Val Lys Leu Phe Pro Arg Leu Glu  
485 490 495

Glu Met Gly Ala Arg Met Leu Leu Gln Val His Asp Glu Leu Val Leu  
500 505 510

Glu Ala Pro Lys Glu Gly Ala Glu Ala Val Ala Arg Leu Ala Lys Glu  
515 520 525

Val Met Glu Gly Val Tyr Pro Leu Ala Val Leu Leu Glu Val Glu Val  
530 535 540

Gly Ile Gly Glu Asp Trp Leu Ser Ala Lys Glu Ala Ala Ala Leu Val  
545 550 555 560

Pro Arg

<210> 35  
<211> 1688  
<212> DNA  
<213> Thermus aquaticus

<400> 35	
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ccccctggcc cccgccccaa ggggccttcg tgggcttgt gctttcccg aaggagccca	120
tgtgggccga tcttctggcc ctggccgccc ccaggggggg ccgggtccac cgggcccccg	180
agccttataa agccctcagg gacctgaagg aggcgcgaaa gcttctcgcc aaagacctga	240
gcgttctggc cctgagggaa ggccttggcc tcccgccccg cgacgacccc atgctcctcg	300
cctacccctt ggacccttcc aacaccaccc ccgaggggggt ggcccggcgc tacggcgaaa	360
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ccgtcctgga ggccctccgc gaggcccacc ccatcgtgga gaagatcctg cagtaccggg	780
agtcaccaa gctgaagagc acctacattt accccttgca ggacccatc caccggatca	840
cgggccgcct ccacacccgc ttcaaccaga cggccacggc cacgggcagg ctaagtagct	900
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tgaagagcga gcgggaggcg gccgagcgca tggcctacaa catgcccgtc cagggcaccg	1440
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cccgatgct cttcaggc cacgacgagc tggcctcga ggccccaaaa gagggggcgg 1560  
aggccgtggc ccggctggcc aaggaggta tggagggggt gtatcccctg gccgtgcccc 1620  
tggaggcgga ggtgggata gggaggatt ggctctccgc caaggaggcg gccgcactgg 1680  
tgccgcgc 1688

<210> 36  
<211> 562  
<212> PRT  
<213> *Thermus aquaticus*

<400> 36

Met Ala Ser Gly Gly Gly Gly Cys Gly Gly Gly Ser Pro Lys Ala  
1 5 10 15

Leu Glu Glu Ala Pro Trp Pro Pro Pro Glu Gly Ala Phe Val Gly Phe  
20 25 30

Val Leu Ser Arg Lys Glu Pro Met Trp Ala Asp Leu Leu Ala Leu Ala  
35 40 45

Ala Ala Arg Gly Gly Arg Val His Arg Ala Pro Glu Pro Tyr Lys Ala  
50 55 60

Leu Arg Asp Leu Lys Glu Ala Arg Gly Leu Leu Ala Lys Asp Leu Ser  
65 70 75 80

Val Leu Ala Leu Arg Glu Gly Leu Gly Leu Pro Pro Gly Asp Asp Pro  
85 90 95

Met Leu Leu Ala Tyr Leu Leu Asp Pro Ser Asn Thr Thr Pro Glu Gly  
100 105 110

Val Ala Arg Arg Tyr Gly Gly Glu Trp Thr Glu Glu Ala Gly Glu Arg  
115 120 125

Ala Ala Leu Ser Glu Arg Leu Phe Ala Asn Leu Trp Gly Arg Leu Glu  
130 135 140

Gly Glu Glu Arg Leu Leu Trp Leu Tyr Arg Glu Val Glu Arg Pro Leu  
145 150 155 160

Ser Ala Val Leu Ala His Met Glu Ala Thr Gly Val Arg Leu Asp Val  
165 170 175

Ala Tyr Leu Arg Ala Leu Ser Leu Glu Val Ala Glu Glu Ile Ala Arg  
180 185 190

Leu Glu Ala Glu Val Phe Arg Leu Ala Gly His Pro Phe Asn Leu Asn  
195 200 205

Ser Arg Asp Gln Leu Glu Arg Val Leu Phe Asp Glu Leu Gly Leu Pro  
210 215 220

Ala Ile Gly Lys Thr Glu Lys Thr Gly Lys Arg Ser Thr Ser Ala Ala  
225 230 235 240

Val Leu Glu Ala Leu Arg Glu Ala His Pro Ile Val Glu Lys Ile Leu  
245 250 255

Gln Tyr Arg Glu Leu Thr Lys Leu Lys Ser Thr Tyr Ile Asp Pro Leu  
260 265 270

Gln Asp Leu Ile His Pro Ser Thr Gly Arg Leu His Thr Arg Phe Asn  
275 280 285

Gln Thr Ala Thr Ala Thr Gly Arg Leu Ser Ser Ser Asp Pro Asn Leu  
290 295 300

Gln Asn Ile Pro Val Arg Thr Pro Leu Gly Gln Arg Ile Arg Arg Ala  
305 310 315 320

Phe Ile Ala Glu Glu Gly Trp Leu Leu Val Ala Leu Asp Tyr Ser Gln  
325 330 335

Ile Glu Leu Arg Val Leu Ala His Leu Ser Gly Asp Glu Asn Leu Ile

340

345

350

Arg Val Phe Gln Glu Gly Arg Asp Ile His Thr Glu Thr Ala Ser Trp  
355 360 365

Met Phe Gly Val Pro Arg Glu Ala Val Asp Pro Leu Met Arg Arg Ala  
370 375 380

Ala Lys Thr Ile Asn Phe Gly Val Leu Tyr Gly Met Ser Ala His Arg  
385 390 395 400

Leu Ser Gln Glu Leu Ala Ile Pro Tyr Glu Glu Ala Gln Ala Phe Ile  
405 410 415

Glu Arg Tyr Phe Gln Ser Phe Pro Lys Val Arg Ala Trp Ile Glu Lys  
420 425 430

Thr Leu Glu Glu Gly Arg Arg Arg Gly Tyr Val Glu Thr Leu Phe Gly  
435 440 445

Arg Arg Arg Tyr Val Pro Asp Leu Glu Ala Arg Val Lys Ser Glu Arg  
450 455 460

Glu Ala Ala Glu Arg Met Ala Tyr Asn Met Pro Val Gln Gly Thr Ala  
465 470 475 480

Ala Asp Leu Met Lys Leu Ala Met Val Lys Leu Phe Pro Arg Leu Glu  
485 490 495

Glu Met Gly Ala Arg Met Leu Leu Gln Val His Asp Glu Leu Val Leu  
500 505 510

Glu Ala Pro Lys Glu Gly Ala Glu Ala Val Ala Arg Leu Ala Lys Glu  
515 520 525

Val Met Glu Gly Val Tyr Pro Leu Ala Val Pro Leu Glu Ala Glu Val  
530 535 540

Gly Ile Gly Glu Asp Trp Leu Ser Ala Lys Glu Ala Ala Ala Leu Val  
545 550 555 560

Pro Arg

<210> 37  
<211> 1688  
<212> DNA  
<213> *Thermus aquaticus*

<400> 37  
ccatggcctc tggggcggt ggctgtggtg gcgggtggcag ccccaaggcc ctggaggagg 60  
ccccctggcc cccgcccggaa ggggccttcg tgggctttgt gcttcccgc aaggagccca 120  
tgtggccga ttttctggcc ctggccgccc ccaggggggg ccgggtccac cgggcccccg 180  
agccttataa agccctcagg gacctgaagg aggcgcgaaa gcttctcgcc aaagacctga 240  
gcgttctggc cctgagggaa ggccttggcc tcccgcccg cgacgacccc atgctcctcg 300  
cctacccctt ggacccttcc aacaccaccc ccgaggggggt ggcccgccgc tacggcgaaa 360  
agtggacgga ggaggcgaaa gagcggcccg cccttccga gaggctttc gccaacctgt 420  
gggggaggct tgagggggag gagaggctcc tttggctta ccgggaggtg gagaggcccc 480  
tttccgctgt cctggcccac atggaggcca cgggggtgcg cctggacgtg gcctatctca 540  
gggccttgc cctggaggtg gccgaggaga tcgccccct cgaggccgag gtcttccgccc 600  
tggccggcca ccccttcaac ctcaactccc gggaccagct gaaaagggtc ctcttgacg 660  
agcttagggct tcccgccatc ggcaagacgg agaagaccgg caagcgctcc accagcgccg 720  
ccgtcctgga ggcctccgc gaggccacc ccatcgtgga gaagatcctg cagtaccggg 780  
agctcaccaa gctgaagagc acctacattt accccttgcc ggacctcatc caccccgaaa 840  
cgggccgcct ccacacccgc ttcaaccaga cggccacggc cacgggcagg ctaagtagct 900  
ccgatcccaa cctccagaac atccccgtcc gcaccccgct tggcagagg atccgcccggg 960  
ccttcatcgc cgaggagggg tggctattgg tggccctgga ctatagccag atagagctca 1020  
gggtgctggc ccaccttcc ggcgacgaga acctgatccg ggtcttccag gagggggcgaa 1080  
acatccacac ggagaccgaa agctggatgt tcggcgtccc ccgggaggcc gtggacccccc 1140

tgatgcgccc ggcggccaag accatcaact tcggggtcct ctacggcatg tcggcccacc 1200  
gcctctccca ggagctagcc atcccttacg aggaggccca ggccttcatt gagcgctact 1260  
ttcagagctt ccccaaggtg cgggcctgga ttgagaagac cctggaggag ggcaggaggc 1320  
gggggtacgt ggagaccctc ttcggccgccc gccgctacgt gccagaccta gaggcccggg 1380  
tgaagagcgt gcgggaggcg gccgagcgca tggccttcaa catgcccgtc cagggcaccc 1440  
ccgcccaccc cgtgaagctg gctatggtga agctttccc caggctggag gaaatggggg 1500  
ccagggatgct cttcaggc acgacgagc tggcctcga ggccccaaaa gaggggggcgg 1560  
aggccgtggc ccggctggcc aaggaggta tggagggggt gtatcccctg gccgtgcccc 1620  
tggaggtgga ggtgggata gggaggact ggctctccgc caaggaggcg gccgcactgg 1680  
tgccgcgc 1688

<210> 38  
<211> 562  
<212> PRT  
<213> *Thermus aquaticus*  
  
<400> 38

Met Ala Ser Gly Gly Gly Gly Cys Gly Gly Gly Ser Pro Lys Ala  
1 5 10 15

Leu Glu Glu Ala Pro Trp Pro Pro Pro Glu Gly Ala Phe Val Gly Phe  
20 25 30

Val Leu Ser Arg Lys Glu Pro Met Trp Ala Asp Leu Leu Ala Leu Ala  
35 40 45

Ala Ala Arg Gly Gly Arg Val His Arg Ala Pro Glu Pro Tyr Lys Ala  
50 55 60

Leu Arg Asp Leu Lys Glu Ala Arg Gly Leu Leu Ala Lys Asp Leu Ser  
65 70 75 80

Val Leu Ala Leu Arg Glu Gly Leu Gly Leu Pro Pro Gly Asp Asp Pro  
85 90 95

Met Leu Leu Ala Tyr Leu Leu Asp Pro Ser Asn Thr Thr Pro Glu Gly  
100 105 110

Val Ala Arg Arg Tyr Gly Gly Glu Trp Thr Glu Glu Ala Gly Glu Arg  
115 120 125

Ala Ala Leu Ser Glu Arg Leu Phe Ala Asn Leu Trp Gly Arg Leu Glu  
130 135 140

Gly Glu Glu Arg Leu Leu Trp Leu Tyr Arg Glu Val Glu Arg Pro Leu  
145 150 155 160

Ser Ala Val Leu Ala His Met Glu Ala Thr Gly Val Arg Leu Asp Val  
165 170 175

Ala Tyr Leu Arg Ala Leu Ser Leu Glu Val Ala Glu Glu Ile Ala Arg  
180 185 190

Leu Glu Ala Glu Val Phe Arg Leu Ala Gly His Pro Phe Asn Leu Asn  
195 200 205

Ser Arg Asp Gln Leu Glu Arg Val Leu Phe Asp Glu Leu Gly Leu Pro  
210 215 220

Ala Ile Gly Lys Thr Glu Lys Thr Gly Lys Arg Ser Thr Ser Ala Ala  
225 230 235 240

Val Leu Glu Ala Leu Arg Glu Ala His Pro Ile Val Glu Lys Ile Leu  
245 250 255

Gln Tyr Arg Glu Leu Thr Lys Leu Lys Ser Thr Tyr Ile Asp Pro Leu  
260 265 270

Pro Asp Leu Ile His Pro Arg Thr Gly Arg Leu His Thr Arg Phe Asn  
275 280 285

Gln Thr Ala Thr Ala Thr Gly Arg Leu Ser Ser Ser Asp Pro Asn Leu

290

295

300

Gln Asn Ile Pro Val Arg Thr Pro Leu Gly Gln Arg Ile Arg Arg Ala  
305 310 315 320

Phe Ile Ala Glu Glu Gly Trp Leu Leu Val Ala Leu Asp Tyr Ser Gln  
325 330 335

Ile Glu Leu Arg Val Leu Ala His Leu Ser Gly Asp Glu Asn Leu Ile  
340 345 350

Arg Val Phe Gln Glu Gly Arg Asp Ile His Thr Glu Thr Ala Ser Trp  
355 360 365

Met Phe Gly Val Pro Arg Glu Ala Val Asp Pro Leu Met Arg Arg Ala  
370 375 380

Ala Lys Thr Ile Asn Phe Gly Val Leu Tyr Gly Met Ser Ala His Arg  
385 390 395 400

Leu Ser Gln Glu Leu Ala Ile Pro Tyr Glu Glu Ala Gln Ala Phe Ile  
405 410 415

Glu Arg Tyr Phe Gln Ser Phe Pro Lys Val Arg Ala Trp Ile Glu Lys  
420 425 430

Thr Leu Glu Glu Gly Arg Arg Gly Tyr Val Glu Thr Leu Phe Gly  
435 440 445

Arg Arg Arg Tyr Val Pro Asp Leu Glu Ala Arg Val Lys Ser Val Arg  
450 455 460

Glu Ala Ala Glu Arg Met Ala Phe Asn Met Pro Val Gln Gly Thr Ala  
465 470 475 480

Ala Asp Leu Val Lys Leu Ala Met Val Lys Leu Phe Pro Arg Leu Glu  
485 490 495

Glu Met Gly Ala Arg Met Leu Leu Gln Val His Asp Glu Leu Val Leu  
500 505 510

Glu Ala Pro Lys Glu Gly Ala Glu Ala Val Ala Arg Leu Ala Lys Glu  
515 520 525

Val Met Glu Gly Val Tyr Pro Leu Ala Val Pro Leu Glu Val Glu Val  
530 535 540

Gly Ile Gly Glu Asp Trp Leu Ser Ala Lys Glu Ala Ala Ala Leu Val  
545 550 555 560

Pro Arg

<210> 39  
<211> 12  
<212> PRT  
<213> Artificial Sequence

<220>  
<223> Synthetic Peptide

<400> 39

Met Ala Ser Gly Gly Gly Gly Cys Gly Gly Gly  
1 5 10

<210> 40  
<211> 17  
<212> PRT  
<213> Artificial Sequence

<220>  
<223> Synthetic Peptide

<400> 40

Ala Ala Ala Leu Val Pro Arg Gly Ser Leu Glu His His His His His  
1 5 10 15

His

<210> 41  
<211> 22  
<212> PRT  
<213> Artificial Sequence

<220>  
<223> Synthetic Peptide

<400> 41

Met Lys Tyr Leu Leu Pro Thr Ala Ala Ala Gly Leu Leu Leu Leu Ala  
1 5 10 15

Ala Gln Pro Ala Met Ala  
20

<210> 42  
<211> 22  
<212> PRT  
<213> Artificial Sequence

<220>  
<223> Synthetic Peptide

<400> 42

Met Lys Thr Leu Leu Ala Met Val Leu Val Gly Leu Leu Leu Leu Pro  
1 5 10 15

Pro Gly Pro Ser Met Ala  
20

<210> 43  
<211> 22  
<212> PRT  
<213> Artificial Sequence

<220>  
<223> Synthetic Peptide

<400> 43

Met Arg Gly Leu Leu Ala Met Leu Val Ala Gly Leu Leu Leu Leu Pro  
1 5 10 15

Ile Ala Pro Ala Met Ala  
20

<210> 44  
<211> 21  
<212> PRT  
<213> Artificial Sequence

<220>  
<223> Synthetic Peptide

<400> 44

Met Arg Arg Leu Leu Val Ile Ala Ala Gly Leu Leu Leu Leu Ala  
1 5 10 15

Pro Pro Thr Met Ala  
20

<210> 45  
<211> 33  
<212> DNA  
<213> Artificial Sequence

<220>  
<223> Synthetic DNA

<400> 45  
gcggccgcac tggtgccgcg cggcagcctc gag

33

<210> 46  
<211> 148  
<212> PRT  
<213> Homo sapiens

<400> 46

Ala Asp Gln Leu Thr Glu Glu Gln Ile Ala Glu Phe Lys Glu Ala Phe  
1 5 10 15

Ser Leu Phe Asp Lys Asp Gly Asp Gly Thr Ile Thr Thr Lys Glu Leu  
20 25 30

Gly Thr Val Met Arg Ser Leu Gly Gln Asn Pro Thr Glu Ala Glu Leu  
35 40 45

Gln Asp Met Ile Asn Glu Val Asp Ala Asp Gly Asn Gly Thr Ile Asp  
50 55 60

Phe Pro Glu Phe Leu Thr Met Met Ala Arg Lys Met Lys Asp Thr Asp  
65 70 75 80

Ser Glu Glu Glu Ile Arg Glu Ala Phe Arg Val Phe Asp Lys Asp Gly  
85 90 95

Asn Gly Tyr Ile Ser Ala Ala Glu Leu Arg His Val Met Thr Asn Leu  
100 105 110

Gly Glu Lys Leu Thr Asp Glu Glu Val Asp Glu Met Ile Arg Glu Ala  
115 120 125

Asp Ile Asp Gly Asp Gly Gln Val Asn Tyr Glu Glu Phe Val Gln Met  
130 135 140

Met Thr Ala Lys  
145

<210> 47  
<211> 114  
<212> PRT  
<213> Artificial Sequence

<220>  
<223> Synthetic DNA

<400> 47

Gln Val Gln Leu Gln Gln Ser Gly Pro Glu Asp Val Lys Pro Gly Ala  
1 5 10 15

Ser Val Lys Ile Ser Cys Lys Ala Ser Gly Tyr Thr Phe Thr Asp Tyr  
20 25 30

Tyr Met Asn Trp Val Lys Gln Ser Pro Gly Lys Gly Leu Glu Trp Ile  
35 40 45

Gly Asp Ile Asn Pro Asn Asn Gly Gly Thr Ser Tyr Asn Gln Lys Phe  
50 55 60

Lys Gly Arg Ala Thr Leu Thr Val Asp Lys Ser Ser Ser Thr Ala Tyr  
65 70 75 80

Met Glu Leu Arg Ser Leu Thr Ser Glu Asp Ser Ser Val Tyr Tyr Cys  
85 90 95

Glu Ser Gln Ser Gly Ala Tyr Trp Gly Gln Gly Thr Thr Val Thr Val  
100 105 110

Ser Ala

<210> 48  
<211> 20  
<212> PRT  
<213> Artificial Sequence

<220>  
<223> Synthetic Peptide

<400> 48

Gly Gly Gly Gly Ser Gly Gly Gly Ser Gly Gly Gly Ser Gly  
1 5 10 15

Gly Gly Gly Ser  
20

<210> 49  
<211> 116  
<212> PRT  
<213> Artificial Sequence

<220>  
<223> Synthetic Peptide

<400> 49

Asp Tyr Lys Asp Ile Leu Met Thr Gln Thr Pro Ser Ser Leu Pro Val  
1 5 10 15

Ser Leu Gly Asp Gln Ala Ser Ile Ser Cys Arg Ser Ser Gln Ser Ile  
20 25 30

Val His Ser Asn Gly Asn Thr Tyr Leu Glu Trp Tyr Leu Gln Lys Pro  
35 40 45

Gly Gln Ser Pro Lys Leu Leu Ile Tyr Lys Val Ser Asn Arg Phe Ser  
50 55 60

Gly Val Pro Asp Arg Phe Ser Gly Ser Gly Ser Gly Thr Asp Phe Thr  
65 70 75 80

Leu Lys Ile Ser Arg Val Glu Ala Glu Asp Leu Gly Val Tyr Tyr Cys  
85 90 95

Phe Gln Gly Ser His Val Pro Phe Thr Phe Gly Ser Gly Thr Lys Leu  
100 105 110

Glu Ile Lys Arg  
115

<210> 50  
<211> 291  
<212> PRT  
<213> *Thermus thermophilus*

<400> 50

Met Glu Ala Met Leu Pro Leu Phe Glu Pro Lys Gly Arg Val Leu Leu  
1 5 10 15

Val Asp Gly His His Leu Ala Tyr Arg Thr Phe Phe Ala Leu Lys Gly  
20 25 30

Leu Thr Thr Ser Arg Gly Glu Pro Val Gln Ala Val Tyr Gly Phe Ala  
35 40 45

Lys Ser Leu Leu Lys Ala Leu Lys Glu Asp Gly Tyr Lys Ala Val Phe  
50 55 60

Val Val Phe Asp Ala Lys Ala Pro Ser Phe Arg His Glu Ala Tyr Glu  
65 70 75 80

Ala Tyr Lys Ala Gly Arg Ala Pro Thr Pro Glu Asp Phe Pro Arg Gln  
85 90 95

Leu Ala Leu Ile Lys Glu Leu Val Asp Leu Leu Gly Phe Thr Arg Leu  
100 105 110

Glu Val Pro Gly Tyr Glu Ala Asp Asp Val Leu Ala Thr Leu Ala Lys  
115 120 125

Lys Ala Glu Lys Glu Gly Tyr Glu Val Arg Ile Leu Thr Ala Asp Arg  
130 135 140

Asp Leu Tyr Gln Leu Val Ser Asp Arg Val Ala Val Leu His Pro Glu  
145 150 155 160

Gly His Leu Ile Thr Pro Glu Trp Leu Trp Glu Lys Tyr Gly Leu Arg  
165 170 175

Pro Glu Gln Trp Val Asp Phe Arg Ala Leu Val Gly Asp Pro Ser Asp  
180 185 190

Asn Leu Pro Gly Val Lys Gly Ile Gly Glu Lys Thr Ala Leu Lys Leu  
195 200 205

Leu Lys Glu Trp Gly Ser Leu Glu Asn Leu Leu Lys Asn Leu Asp Arg  
210 215 220

Val Lys Pro Glu Asn Val Arg Glu Lys Ile Lys Ala His Leu Glu Asp  
225 230 235 240

Leu Arg Leu Ser Leu Glu Leu Ser Arg Val Arg Thr Asp Leu Pro Leu  
245 250 255

Glu Val Asp Leu Ala Gln Gly Arg Glu Pro Asp Arg Glu Gly Leu Arg

260

265

270

Ala Phe Leu Glu Arg Leu Glu Phe Gly Ser Leu Leu His Glu Phe Gly  
275 280 285

Leu Leu Glu  
290

<210> 51  
<211> 196  
<212> PRT  
<213> Escherichia coli  
  
<400> 51

Val Ile Ser Tyr Asp Asn Tyr Val Thr Ile Leu Asp Glu Glu Thr Leu  
1 5 10 15

Lys Ala Trp Ile Ala Lys Leu Glu Lys Ala Pro Val Phe Ala Phe Asp  
20 25 30

Thr Glu Thr Asp Ser Leu Asp Asn Ile Ser Ala Asn Leu Val Gly Leu  
35 40 45

Ser Phe Ala Ile Glu Pro Gly Val Ala Ala Tyr Ile Pro Val Ala His  
50 55 60

Asp Tyr Leu Asp Ala Pro Asp Gln Ile Ser Arg Glu Arg Ala Leu Glu  
65 70 75 80

Leu Leu Lys Pro Leu Leu Glu Asp Glu Lys Ala Leu Lys Val Gly Gln  
85 90 95

Asn Leu Lys Tyr Asp Arg Gly Ile Leu Ala Asn Tyr Gly Ile Glu Leu  
100 105 110

Arg Gly Ile Ala Phe Asp Thr Met Leu Glu Ser Tyr Ile Leu Asn Ser  
115 120 125

Val Ala Gly Arg His Asp Met Asp Ser Leu Ala Glu Arg Trp Leu Lys

130

135

140

His Lys Thr Ile Thr Phe Glu Glu Ile Ala Gly Lys Gly Lys Asn Gln  
145 150 155 160

Leu Thr Phe Asn Gln Ile Ala Leu Glu Glu Ala Gly Arg Tyr Ala Ala  
165 170 175

Glu Asp Ala Asp Val Thr Leu Gln Leu His Leu Lys Met Trp Pro Asp  
180 185 190

Leu Gln Lys His  
195

<210> 52  
<211> 686  
<212> PRT  
<213> *Bacillus circulans*

<400> 52

Ala Pro Asp Thr Ser Val Ser Asn Lys Gln Asn Phe Ser Thr Asp Val  
1 5 10 15

Ile Tyr Gln Ile Phe Thr Asp Arg Phe Ser Asp Gly Asn Pro Ala Asn  
20 25 30

Asn Pro Thr Gly Ala Ala Phe Asp Gly Thr Cys Thr Asn Leu Arg Leu  
35 40 45

Tyr Cys Gly Gly Asp Trp Gln Gly Ile Ile Asn Lys Ile Asn Asp Gly  
50 55 60

Tyr Leu Thr Gly Met Gly Val Thr Ala Ile Trp Ile Ser Gln Pro Val  
65 70 75 80

Glu Asn Ile Tyr Ser Ile Ile Asn Tyr Ser Gly Val Asn Asn Thr Ala  
85 90 95

Tyr His Gly Tyr Trp Ala Arg Asp Phe Lys Lys Thr Asn Pro Ala Tyr

100

105

110

Gly Thr Ile Ala Asp Phe Gln Asn Leu Ile Ala Ala Ala His Ala Lys  
115 120 125

Asn Ile Lys Val Ile Asp Phe Ala Pro Asn His Thr Ser Pro Ala  
130 135 140

Ser Ser Asp Gln Pro Ser Phe Ala Glu Asn Gly Arg Leu Tyr Asp Asn  
145 150 155 160

Gly Thr Leu Leu Gly Gly Tyr Thr Asn Asp Thr Gln Asn Leu Phe His  
165 170 175

His Asn Gly Gly Thr Asp Phe Ser Thr Thr Glu Asn Gly Ile Tyr Lys  
180 185 190

Asn Leu Tyr Asp Leu Ala Asp Leu Asn His Asn Asn Ser Thr Val Asp  
195 200 205

Val Tyr Leu Lys Asp Ala Ile Lys Met Trp Leu Asp Leu Gly Ile Asp  
210 215 220

Gly Ile Arg Met Asp Ala Val Lys His Met Pro Phe Gly Trp Gln Lys  
225 230 235 240

Ser Phe Met Ala Ala Val Asn Asn Tyr Lys Pro Val Phe Thr Phe Gly  
245 250 255

Glu Trp Phe Leu Gly Val Asn Glu Val Ser Pro Glu Asn His Lys Phe  
260 265 270

Ala Asn Glu Ser Gly Met Ser Leu Leu Asp Phe Arg Phe Ala Gln Lys  
275 280 285

Val Arg Gln Val Phe Arg Asp Asn Thr Asp Asn Met Tyr Gly Leu Lys  
290 295 300

Ala Met Leu Glu Gly Ser Ala Ala Asp Tyr Ala Gln Val Asp Asp Gln  
305 310 315 320

Val Thr Phe Ile Asp Asn His Asp Met Glu Arg Phe His Ala Ser Asn  
325 330 335

Ala Asn Arg Arg Lys Leu Glu Gln Ala Leu Ala Phe Thr Leu Thr Ser  
340 345 350

Arg Gly Val Pro Ala Ile Tyr Tyr Gly Thr Glu Gln Tyr Met Ser Gly  
355 360 365

Gly Thr Asp Pro Asp Asn Arg Ala Arg Ile Pro Ser Phe Ser Thr Ser  
370 375 380

Thr Thr Ala Tyr Gln Val Ile Gln Lys Leu Ala Pro Leu Arg Lys Cys  
385 390 395 400

Asn Pro Ala Ile Ala Tyr Gly Ser Thr Gln Glu Arg Trp Ile Asn Asn  
405 410 415

Asp Val Leu Ile Tyr Glu Arg Lys Phe Gly Ser Asn Val Ala Val Val  
420 425 430

Ala Val Asn Arg Asn Leu Asn Ala Pro Ala Ser Ile Ser Gly Leu Val  
435 440 445

Thr Ser Leu Pro Gln Gly Ser Tyr Asn Asp Val Leu Gly Gly Leu Leu  
450 455 460

Asn Gly Asn Thr Leu Ser Val Gly Ser Gly Gly Ala Ala Ser Asn Phe  
465 470 475 480

Thr Leu Ala Ala Gly Gly Thr Ala Val Trp Gln Tyr Thr Ala Ala Thr  
485 490 495

Ala Thr Pro Thr Ile Gly His Val Gly Pro Met Met Ala Lys Pro Gly  
500 505 510

Val Thr Ile Thr Ile Asp Gly Arg Gly Phe Gly Ser Ser Lys Gly Thr  
515 520 525

Val Tyr Phe Gly Thr Thr Ala Val Ser Gly Ala Asp Ile Thr Ser Trp  
530 535 540

Glu Asp Thr Gln Ile Lys Val Lys Ile Pro Ala Val Ala Gly Gly Asn  
545 550 555 560

Tyr Asn Ile Lys Val Ala Asn Ala Ala Gly Thr Ala Ser Asn Val Tyr  
565 570 575

Asp Asn Phe Glu Val Leu Ser Gly Asp Gln Val Ser Val Arg Phe Val  
580 585 590

Val Asn Asn Ala Thr Thr Ala Leu Gly Gln Asn Val Tyr Leu Thr Gly  
595 600 605

Ser Val Ser Glu Leu Gly Asn Trp Asp Pro Ala Lys Ala Ile Gly Pro  
610 615 620

Met Tyr Asn Gln Val Val Tyr Gln Tyr Pro Asn Trp Tyr Tyr Asp Val  
625 630 635 640

Ser Val Pro Ala Gly Lys Thr Ile Glu Phe Lys Phe Leu Lys Lys Gln  
645 650 655

Gly Ser Thr Val Thr Trp Glu Gly Ser Asn His Thr Phe Thr Ala  
660 665 670

Pro Ser Ser Gly Thr Ala Thr Ile Asn Val Asn Trp Gln Pro  
675 680 685

<210> 53  
<211> 399  
<212> PRT  
<213> *Bordetella pertussis*

<400> 53

Met Gln Gln Ser His Gln Ala Gly Tyr Ala Asn Ala Ala Asp Arg Glu  
1 5 10 15

Ser Gly Ile Pro Ala Ala Val Leu Asp Gly Ile Lys Ala Val Ala Lys  
20 25 30

Glu Lys Asn Ala Thr Leu Met Phe Arg Leu Val Asn Pro His Ser Thr  
35 40 45

Ser Leu Ile Ala Glu Gly Val Ala Thr Lys Gly Leu Gly Val His Ala  
50 55 60

Lys Ser Ser Asp Trp Gly Leu Gln Ala Gly Tyr Ile Pro Val Asn Pro  
65 70 75 80

Asn Leu Ser Lys Leu Phe Gly Arg Ala Pro Glu Val Ile Ala Arg Ala  
85 90 95

Asp Asn Asp Val Asn Ser Ser Leu Ala His Gly His Thr Ala Val Asp  
100 105 110

Leu Thr Leu Ser Lys Glu Arg Leu Asp Tyr Leu Arg Gln Ala Gly Leu  
115 120 125

Val Thr Gly Met Ala Asp Gly Val Val Ala Ser Asn His Ala Gly Tyr  
130 135 140

Glu Gln Phe Glu Phe Arg Val Lys Glu Thr Ser Asp Gly Arg Tyr Ala  
145 150 155 160

Val Gln Tyr Arg Arg Lys Gly Gly Asp Asp Phe Glu Ala Val Lys Val  
165 170 175

Ile Gly Asn Ala Ala Gly Ile Pro Leu Thr Ala Asp Ile Asp Met Phe  
180 185 190

Ala Ile Met Pro His Leu Ser Asn Phe Arg Asp Ser Ala Arg Ser Ser  
195 200 205

Val Thr Ser Gly Asp Ser Val Thr Asp Tyr Leu Ala Arg Thr Arg Arg  
210 215 220

Ala Ala Ser Glu Ala Thr Gly Gly Leu Asp Arg Glu Arg Ile Asp Leu  
225 230 235 240

Leu Trp Lys Ile Ala Arg Ala Gly Ala Arg Ser Ala Val Gly Thr Glu  
245 250 255

Ala Arg Arg Gln Phe Arg Tyr Asp Gly Asp Met Asn Ile Gly Val Ile  
260 265 270

Thr Asp Phe Glu Leu Glu Val Arg Asn Ala Leu Asn Arg Arg Ala His  
275 280 285

Ala Val Gly Ala Gln Asp Val Val Gln His Gly Thr Glu Gln Asn Asn  
290 295 300

Pro Phe Pro Glu Ala Asp Glu Lys Ile Phe Val Val Ser Ala Thr Gly  
305 310 315 320

Glu Ser Gln Met Leu Thr Arg Gly Gln Leu Lys Glu Tyr Ile Gly Gln  
325 330 335

Gln Arg Gly Glu Gly Tyr Val Phe Tyr Glu Asn Arg Ala Tyr Gly Val  
340 345 350

Ala Gly Lys Ser Leu Phe Asp Asp Gly Leu Gly Ala Ala Pro Gly Val  
355 360 365

Pro Ser Gly Arg Ser Lys Phe Ser Pro Asp Val Leu Glu Thr Val Pro  
370 375 380

Ala Ser Pro Gly Leu Arg Arg Pro Ser Leu Gly Ala Val Glu Arg  
385 390 395

<211> 275

<212> PRT

<213> *Bacillus amyloliquefaciens*

<400> 54

Ala Gln Ser Val Pro Tyr Gly Val Ser Gln Ile Lys Ala Pro Ala Leu  
1 5 10 15

His Ser Gln Gly Tyr Thr Gly Ser Asn Val Lys Val Ala Val Ile Asp  
20 25 30

Ser Gly Ile Asp Ser Ser His Pro Asp Leu Lys Val Ala Gly Gly Ala  
35 40 45

Ser Met Val Pro Ser Glu Thr Asn Pro Phe Gln Asp Asn Asn Ser His  
50 55 60

Gly Thr His Val Ala Gly Thr Val Ala Ala Leu Asn Asn Ser Ile Gly  
65 70 75 80

Val Leu Gly Val Ala Pro Ser Ala Ser Leu Tyr Ala Val Lys Val Leu  
85 90 95

Gly Ala Asp Gly Ser Gly Gln Tyr Ser Trp Ile Ile Asn Gly Ile Glu  
100 105 110

Trp Ala Ile Ala Asn Asn Met Asp Val Ile Asn Met Ser Leu Gly Gly  
115 120 125

Pro Ser Gly Ser Ala Ala Leu Lys Ala Ala Val Asp Lys Ala Val Ala  
130 135 140

Ser Gly Val Val Val Val Ala Ala Ala Gly Asn Glu Gly Thr Ser Gly  
145 150 155 160

Ser Ser Ser Thr Val Gly Tyr Pro Gly Lys Tyr Pro Ser Val Ile Ala  
165 170 175

Val Gly Ala Val Asp Ser Ser Asn Gln Arg Ala Ser Phe Ser Ser Val

180

185

190

Gly Pro Glu Leu Asp Val Met Ala Pro Gly Val Ser Ile Gln Ser Thr  
195 200 205

Leu Pro Gly Asn Lys Tyr Gly Ala Tyr Asn Gly Thr Ser Met Ala Ser  
210 215 220

Pro His Val Ala Gly Ala Ala Leu Ile Leu Ser Lys His Pro Asn  
225 230 235 240

Trp Thr Asn Thr Gln Val Arg Ser Ser Leu Glu Asn Thr Thr Thr Lys  
245 250 255

Leu Gly Asp Ser Phe Tyr Tyr Gly Lys Gly Leu Ile Asn Val Gln Ala  
260 265 270

Ala Ala Gln  
275

<210> 55  
<211> 182  
<212> PRT  
<213> *Bacillus subtilis*

<400> 55

Ala Ala Glu His Asn Pro Val Val Met Val His Gly Ile Gly Gly Ala  
1 5 10 15

Ser Phe Asn Phe Ala Gly Ile Lys Ser Tyr Leu Val Ser Gln Gly Trp  
20 25 30

Ser Arg Asp Lys Leu Tyr Ala Val Asp Phe Trp Asp Lys Thr Gly Thr  
35 40 45

Asn Tyr Asn Asn Gly Pro Val Leu Ser Arg Phe Val Gln Lys Val Leu  
50 55 60

Asp Glu Thr Gly Ala Lys Lys Val Asp Ile Val Ala His Ser Met Gly

65

70

75

80

Gly Ala Asn Thr Leu Tyr Tyr Ile Lys Asn Leu Asp Gly Gly Asn Lys  
85 90 95

Val Ala Asn Val Val Thr Leu Gly Gly Ala Asn Arg Leu Thr Thr Gly  
100 105 110

Lys Ala Leu Pro Gly Thr Asp Pro Asn Gln Lys Ile Leu Tyr Thr Ser  
115 120 125

Ile Tyr Ser Ser Ala Asp Met Ile Val Met Asn Tyr Leu Ser Arg Leu  
130 135 140

Asp Gly Ala Arg Asn Val Gln Ile His Gly Val Gly His Ile Gly Leu  
145 150 155 160

Leu Tyr Ser Ser Gln Val Asn Ser Leu Ile Lys Glu Gly Leu Asn Gly  
165 170 175

Gly Gly Gln Asn Thr Asn  
180

<210> 56

<211> 444

<212> DNA

<213> Homo sapiens

<400> 56

gctgaccaac tgactgaaga gcagattgca gaattcaaag aagcttttc actatttgc 60  
aaagatggtg atggaactat aacaacaaag gaattggaa ctgtaatgag atctcttgg 120  
cagaatccca cagaagcaga gttacaggac atgatataatg aagtagatgc tgatggtaat 180  
ggcacaattg acttccctga atttctgaca atgatggcaa gaaaaatgaa agacacagac 240  
agtgaagaag aaatttagaga agcattccgt gtgtttgata aggatggcaa tggctatatt 300  
agtgctgcag aacttcgcca tgtgatgaca aaccttggag agaagttaac agatgaagaa 360  
gttcatgaaa tgatcagggaa agcagatatt gatggtgatg gtcaagtaaa ctatgaagag 420

tttgtacaaa tcatgacagc aaag

444

<210> 57  
<211> 2058  
<212> DNA  
<213> *Bacillus circulans*

<400> 57  
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ggaacctgca cgaacctccg gctgtattgc ggcggcgact ggcagggcat catcaacaaa 180  
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gaaaacatct acagcatcat caattattcc ggcgtaaaca acacggccta tcacggctac 300  
tgggcccggg acttcaagaa gacgaatccg gcctacggca cgattgcgg a cttccagaac 360  
ctgatcgccg ccgcgcatgc aaaaaacatc aaagtcat tgcactttgc cccgaaccat 420  
acgtcgcccg cctcggtccga ccagccttcc tttgcggaaa acggccggct gtacgataac 480  
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agcgttccgg ccggcaaaac gatcgagttc aagttttga aaaaacaagg ctccaccgtc	1980
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aacgtgaatt ggcagcca	2058

<210> 58  
 <211> 1197  
 <212> DNA  
 <213> *Bordetella pertussis*

<400> 58	
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gcagccgtac tcgatggcat caaggccgtg gcgaaaggaaa aaaacgcccac attgatgttc	120
cgcctggta accccatttc caccagcctg attgccgaag gggtggccac caaaggattg	180
ggcgtgcacg ccaagtgcgc cgattgggg ttgcaggcgg gctacattcc cgtcaaccgg	240
aatcttcca aactgttcgg ccgtgcgcgg gaggtgatcg cgccggccga caacgacgtc	300
aacagcagcc tggcgcattgg ccataccgcg gtcgacctga cgctgtcgaa agagcggctt	360
gactatctgc ggcaagcggg cctggtcacc ggcattggccg atggcgtggc cgcgagcaac	420
cacgcaggct acgagcagtt cgagttcgc gtgaaggaaa cctcggacgg ggcgtatgcc	480

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gagcagaaca	atcctttccc	ggaggcagat	gagaagattt	tcgtcgatc	ggccaccgg	960
gaaagccaga	tgctcacg	cggcaactg	aaggaataca	ttggccagca	gcfgggcgag	1020
ggctatgtct	tctacgagaa	ccgtgcatac	ggcgtggcg	ggaaaagcct	gttcgacgat	1080
gggctggag	ccgcgcccgg	cgtgccgagc	ggacgttcga	agttctcgcc	ggatgtactg	1140
gaaacggtgc	cggcgtcacc	cggattgcgg	cggccgtcgc	tggcgca	ggaacgc	1197

<210> 59  
 <211> 825  
 <212> DNA  
 <213> *Bacillus amyloliquefaciens*

<400> 59	gcfgggcgag	tgccctacgg	cgtatcacaa	attaaagccc	ctgctctgca	ctctcaaggc	60
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gatttaaagg	tagcaggcg	agccagcatg	gttccttctg	aaacaaatcc	tttccaagac		180
aacaactctc	acgaaactca	cgttgccggc	acagttgcgg	ctcttaataa	ctcaatcggt		240
gtattaggcg	ttgcgccaag	cgcataactt	tacgctgtaa	aagttctcg	tgctgacggt		300
tccggccaaat	acagctggat	cattaacgga	atcgagtg	ggatcgcaaa	caatatggac		360
gttatttaaca	tgagcctcg	cggaccttct	ggttctgctg	ctttaaaagc	ggcagttgat		420
aaagccgttg	catccggcgt	cgtagtcgtt	gcggcagccg	gtaacgaagg	cacttccggc		480
agctcaagca	cagtgggcta	ccctggtaaa	tacccttctg	tcattgcagt	aggcgctgtt		540
gacagcagca	accaaagagc	atctttctca	agcgtaggac	ctgagcttga	tgtcatggca		600

cctggcgtat	ctatccaaag	cacgcttcct	ggaaacaaat	acggggcgta	caacggtacg	660
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tggacaaaaca	ctcaagtccg	cagcagttt	gaaaacacca	ctacaaaact	tggtgattct	780
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<210> 60  
 <211> 873  
 <212> DNA  
 <213> *Thermus thermophilus*

<400> 60	atggaggcga	tgcttccgct	ctttgaaccc	aaaggccggg	tcctcctgg	ggacggccac	60	
	cacctggcct	accgcacctt	cttcgccc	ctg aaggccctca	ccacgagccg	ggcgaacccg	120	
	gtgcaggcgg	tctacggctt	cgc	ccaagagc	ctc	ctcaagg	ggacgggtac	180
	aaggccgtct	tcgtggtctt	tgacgccaag	gccccctc	tccg	ccacg	ggcctacgag	240
	gcctacaagg	cggggagggc	ccc	gacccccc	gaggacttcc	ccc	ggcagact	300
	aaggagctgg	tggacctc	ctt	gggtttacc	cgc	ctcgagg	tcccccgg	360
	gacgttctcg	ccacc	cttggc	caagaaggcg	gaaaaggagg	ggt	acgagg	420
	accgccc	gac	ctctca	ccaactcg	tcc	gaccg	cgaggcgg	480
	ggccac	ctca	cccccg	gtggcttgg	gagaagtac	gc	tcagg	540
	gtggacttcc	gcgc	ccctcg	ggggaccc	tccgaca	cc	ccgggt	600
	ggggagaaga	ccgc	cctcaa	gctc	ctcaag	gc	ctggaaaa	660
	aac	ctggacc	gtt	aaaacgtc	gagtgg	ct	ggaa	720
	ctcagg	cttggag	ct	ccggacc	gggg	cc	ggac	780
	gccc	gggg	cc	ggcccga	gggg	tt	ggag	840
	ggcag	ccctcc	tc	acgagtt	ccgc	tc	ttt	873

<210> 61  
 <211> 588  
 <212> DNA  
 <213> *Escherichia coli*

<400> 61  
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atctctgcta acctggtcgg gctttcttt gctatcgagc caggcgtagc ggcataattt 180  
ccgggttgctc atgattatct ttagtgcgccc gatcaaattt ctcgcgagcg tgcactcgag 240  
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gatcgccgta ttctggcgaa ctacggcatt gaactgcgtg ggattgcgtt tgataaccatg 360  
ctggagtcct acattctcaa tagcggtgcc gggcgtcacg atatggacag cctcgccgaa 420  
cgttggttga agcacaaaac catcaattt gaagagattt ctggtaaagg caaaaatcaa 480  
ctgaccctta accagattgc cctcgaagaa gccggacgtt acgcccgcga agatgcagat 540  
gtcaccttgc agttgcattct gaaaatgtgg ccggatctgc aaaaacac 588